

SIGHTLESS TECHNICIANS LEARN

RADIO SERVICING

George B. Miller

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HOUSE FOR THE BLIND**





Charles Gibson, shown here working on a midget set, opened up a repair shop in his garage. He now has a reputation for skilled work.

## Sightless Technicians Learn Radio Servicing

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By **GEORGE B. MILLER**

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"I DIDN'T get rich servicing radios, but I can stand on my own hind legs and live independently. I had to have the guts, but I needed the training just as desperately." The quote is from a letter by Melvin Rothmiller who operates a successful radio service shop in Walthill, Neb. He is totally blind.

Mr. Rothmiller says further, "I know it is difficult for a person with vision to understand how a complicated mechanism like a radio could make sense to a blind person, but a blind person who has never handled the insides of a radio is at a greater loss. This one factor is the hardest obstacle for a blind person to overcome. I saw Von Peterson work with a radio, design special equipment, and operate so independently that the prospect of a similar existence carried me through those days. Mama never told me there would be.

"I would do the whole thing over the second time if necessary, but I would rather see another blind person do it the first time."

Along with many other blind and otherwise handicapped persons, Mr. Rothmiller took his training at the Radio Engineering School in Omaha, Neb. Included among the students are multiple amputees, paraplegics, polio victims, arthritics, paralytics, and others with lesser handicaps. A deaf-mute has recently started training in the appliance repair course. In all cases where the graduate has intended to use

his training to earn a living the results have been gratifying.

The school was originated and is directed by LaVon Peterson, cited in Mr. Rothmiller's letter. Blind himself, he has developed special test equipment to enable blind students to make accurate measurements and repair all types of radios, record players, PA systems, and similar equipment. Their notes, taken down in Braille, serve as both study and reference books. They also have a Braille tube manual for identifying tubes and basing arrangements. In most cases the students can identify a radio by name and by circuit and call off the tube lineup merely by sticking their fingers in the back of the set.

The training covers public relations, business practices, bookkeeping, and stock maintenance as well as radio servicing. In the appliance repair course, which includes armature and motor rewinding, it is impossible to tell whether a sighted or a blind person has done a rewind job, and in this work extreme neatness and accuracy is required. Blind students, through necessity, will do a better soldering job than a sighted person.

Charles G. Gibson, who lost his sight at the age of nine, graduated from the school early in 1949 and went home to Ogden, Utah, to open up his own shop. "I searched the town for a suitable location but could not find what I wanted, so I remodeled the garage at my home into a service shop and put up a 3 x 5-

foot sign in the front yard to open up business. The people in the neighborhood have been very good in bringing their work to me.

"I had handbills and business cards printed and got a couple of write-ups in the local paper. I tell every customer to tell his friends. I'm not rich yet, but if business continues to pick up, I'll be making a good living in another year."

With less than an eighth-grade education, but plenty of personality, ability, and aggressiveness, Robert E. Freemole is running a successful radio service shop in Houston, Tex. "I installed a five-speaker PA system in one of our supermarkets, am attending TV schools, building guitar amplifiers, and have been working twelve to fifteen hours on repair work. I have recently added winding speaker fields and transformers and am doing very well." Bob Freemole and his wife are both totally blind.

Don's Radio Sales & Service in Waterloo, Neb., is another successful shop run by a blind technician, Don Misfeldt, who lost his sight in a hunting accident while attending college. "After almost two years my business has been accepted in the town just as any other business would have been. A reputation for fast and complete service with a guarantee to back it up brings in repeated business.

"It is a great satisfaction to me when a customer does not realize my pet nuisance—blindness. I have learned of customers leaving the shop and finding out later that their radios had been serviced by a blind technician."

These men, and many others like them, have accomplished what to the rest of us seems impossible, asking only that they be given a fair chance to demonstrate their ability.



Sightless, but full of determination, Melvin Rothmiller enjoys independence from state aid by repairing radios. He has recently taken up motor rewinding.

RADIO-ELECTRONICS for



will decide it, pretty much the way a doctor feels for the pulse of a patient.

### Hearing plays a part

The radio technician's ears come in for their share of the work, too. They don't have to be as sensitive to sounds as those of a musical maestro, but should be alert to any abnormal quality of a set's reproduction. Some of the ways a radio grates on the ears give valuable clues as to what's wrong. The set that's "dead", for example. Not a quiver, not a hum, not a whisper does it emit. It is as dead as Yorick. Look at the tubes and see if they're lit. If so, one will get you ten that the speaker or the output transformer is at fault. It figures. With the tubes lit there should be some hum, sound of some kind, however faint, issuing from the speaker. And since there isn't, the sound-producing section of the set has gone wrong. That section is made up of the speaker working with the output transformer. A continuity check on the speaker voice coil and both primary and secondary of the output transformer will show which of your two suspects has done the job.

Excessive hum may be another dead giveaway, especially if it is not tunable—that is, doesn't change in intensity with changes in the position of the tuning dial. One logical spot to look for this trouble is the power supply filter, since its job is to avoid such hum. Since the filter capacitors are the weakest links, checking them is in order. Use the substitution check—temporarily replace, until the hum disappears, each capacitor with one known to be good. If this fails, replacing the power output tube will usually do the trick. Many power amplifiers use an unbypassed cathode resistor, and leakage develop-

ing between heater and cathode within the tube will place a 60-cycle voltage on the cathode with respect to ground—equivalent, of course, to a 60-cycle voltage on the grid with respect to cathode. Hence the hum. In receivers using full-wave power supplies the filter ripple is 120 cycles, so that hum will be an octave above the 60-cycle note that a bad output tube would cause.

### Don't be too critical

There is such a thing as being too critical, even for the most conservative worker. If you find that a hum can be heard faintly by poking your ear directly into the speaker grill cloth, don't start tearing the thing apart to find a bum component. The chances are you won't find any. A good 90%—at a conservative estimate—of receivers operating off the a.c. line, with no other signal present, have an audible hum at the speaker. Filters *could* be designed to attenuate the hum level so the ear can't hear it, but in the average-quality set it isn't disturbing enough to warrant elaborate filters. After listening acutely to a set's hum for a while it may seem loud enough to blast windows across the street. Try to listen to it from the point of view of a fairly critical layman rather than a fanatical anti-hummer.

### Bad filters and bypasses

Faulty filter capacitors can be responsible for another kind of ear-offender. In the cheaper table-toppers, these capacitors also function as i.f. screen bypasses. When they open, the screen grid in that i.f. amplifier tube is not working as a proper shield and the stage will oscillate. The set screeches like an agonized banshee. Bridging the suspected capacitor by one known to be

good will put the finger on it. One of these "known-to-be-good" filters—about 20 or 30  $\mu$ f—should be part of your kit, to be used only for such tests.

Distortion is a word which covers a multitude of sins, but one type is a fairly common symptom and points definitely to the faulty component. When speech or music sounds clipped and poor and the volume is low, the cause is usually the coupling capacitor to the output tube grid having developed a high-resistance leak. It's easy to check without disconnecting any leads. Just put the negative terminal of a voltmeter on the grid of the tube, with the positive on its cathode, and watch the reading. If it reads up the scale, the capacitor is O.K. But if the needle goes backward, it's that capacitor. Obviously, you can't hope to get faithful reproduction through an amplifier which is biased wrong—as it will be if the capacitor that keeps the B-plus off the output tube grid goes out of business. Another possible fault showing this same symptom is a gassy output tube, but that's usually supported by other evidence, such as a violet glow within the glass envelope.

### Microphonics

Have you ever heard a set ring like one of Santa's sleigh bells? With the volume control turned down, a pleasant, resonant ping-g-g is occasionally heard, but with the set souped up a bit she really gives out with a sustained peal. This is the "microphonic tube" at work. Even if the tube was perfect when it left the factory, it may develop microphonics with age.

What happens is that the mechanical support of the tube grid weakens, and the grid vibrates, thus modulating the electron stream at the rate of mechanical vibration. The sound from the speaker starts the grid vibrating, which amplifies the sound electronically, and the amplified sound vibrates the grid some more, and so on. Exactly the same sort of effect is produced when the microphone of a PA system is too close to the speaker. To find the mischievous tube, do the same thing the little girl does—smack the tube lightly, but smartly, with the eraser end of a pencil with the set's volume control down. If that ping-g-g results, the tube is guilty.

To sum up, many troubles from which radios suffer can be found without the wholesale use of complex testing equipment. I haven't tried to list all possible symptoms and treatments, nor would I try to convince any technician that he needs nothing but a volt-ohm-meter. Certainly the efficient worker needs a signal generator, a tube checker, an oscilloscope; but he already has, without shelling out hard cash, a good instrument of his own—his own brain equipped with its five senses.<sup>1</sup> For that instrument, no others can provide an adequate substitute.

<sup>1</sup> With the exception of the sense of taste. When a radioman sticks his tongue in a set, it's time to wrap him in a wet sheet and call for the men in white!



Suggested by Anthony A. Munnick, Budapest, Hungary

"D'you still think we should start by saying, 'Big Chief see-um white man's magic music box?'"

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